

scarcely remark that, as the true conjunctions both happened in the daytime, all that could be done was to observe if possible on the preceding and following evenings in both instances.

November 3.—At about 21^h, Sidereal Time, the sky partially cleared in a very hazy manner, showing *Saturn* only for a very short time, and scarcely at all without thin clouds. A diagram, however, was somewhat hastily made of the planet and its surrounding satellites, *Rhea* and *Dione* being to the east, and *Tethys* to the west, considerably short of its greatest elongation. I estimated *Iapetus* to be about 50" south of the major axis of the ring, in a perpendicular raised from the middle of the preceding arm.

The power used was 579, on the two-foot Equatoreal. I accounted *Iapetus* to be slightly brighter than *Tethys*, or, more correctly, it seemed to have a larger but a duller disk than *Tethys*. The sky clouded completely almost before these estimations could be made and registered.

Ray Lodge, Maidenhead.
1874. November 7.

On the Duplicity of the principal Star of ν Scorpii.

By S. W. Burnham, Esq.

It will be remembered that this star was included in my Third Catalogue of the New Double Stars (*Monthly Notices*, December 1873) as being probably a very close pair, with the distance as 0".3, and position-angle about 360°. All doubt has now been removed; and in giving a brief history of this interesting star, the following from that catalogue may be quoted as giving the result of my observations in 1873:—

"I would call particular attention to ν Scorpii (No. 120), which I have very little doubt is an exceedingly close and difficult double star. I examined it several times under the most favourable circumstances, but could not get rid of an apparent elongation of the principal star in a direction nearly north and south. A power of 410 was used, and the utmost care taken in focussing. β Scorpii is an admirable object for this purpose, having about the same declination, and also a companion in the same general direction as the more distant companion to ν Scorpii. β was always seen with a perfectly round and sharply defined disk, and turning the instrument at once on ν , it did not seem possible that the slightly wedge-shaped elongation could be an illusion. Not being able to settle the question positively with my aperture, I requested Professor C. A. Young to examine it with the splendid 9.4-inch Clark refractor of the Dartmouth College Observatory, and he kindly did so. He informs me that he observed it on several occasions, generally under unfavourable

conditions; but the last time the air was pretty steady, and while the elongation might be due to atmospheric dispersion, he was rather inclined to think it was double, although he could not even notch it. In the mean time I had tried it again on a number of superb nights, but with no further result than tending to confirm the previous suspicion. From its great southern declination it would necessarily be a very difficult object in this latitude; and it is only when the air is unusually steady that a sufficiently high power can be used to show it. I trust that some observer in the Southern Hemisphere will give this star a careful examination. I shall certainly be much disappointed if it prove to be single. As a wide pair this star is HV. 106 (= Sh. 220 = Σ C.P. 509). Jacob at Madras in 1847 found that the companion was also double, and that is now a very easy object. Should the principal star also prove to be double, it will make by far the most interesting known quadruple in the heavens."

I commenced observing it this season as early as possible, and from the first had no hesitation in deciding positively that the star was really a close pair, with distance and angle about as first given. The elongation was too plain to be mistaken with my 6-in. refractor, although still a very difficult object. I observed it on nearly every night good enough to give a sharp image with a power of 400 at that low altitude.

I measured the position-angle on six nights, but it was not as well seen with the ordinary eye-pieces, the highest power I could use on the micrometer being less than 350. That is too low a power to give the best measurable elongation. The measures were taken with all possible care; and while the separate results are not very accordant, the differences will not be considered extravagantly large when the excessive difficulty of the object with a small aperture is taken into account. The double companion, CD., was measured alternately with the other, as a sort of check.

A and B	C and D		
P = 357.9	P = 45.8	May 13	5 measures
361.7	45.5	" 21	9 "
352.8	43.7	" 25	8 "
351.1	45.6	" 26	5 "
362.4	48.7	" 29	6 "
360.2	44.7	June 18	4 "
Mean = 357.7	45.7		

I then learned that it had been seen double at Washington with the great 26-in. refractor, and one set of measures made by Professor Newcomb, as follows:—

A and B	P = 50.2	June 22	4 measures
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Under date of August 16, I received from Baron Dembowski a series of measures of new double stars, and among them observations of these stars as given below:—

	Position.	Distance.	Magnitudes.	Date.
A and B {	359.5	wedged	4.0, 6.0	1874.467 (1)
	359.3	"	4.5, 7.0	1874.500 (2)
	358.6	0.84	4.0, 7.0	1874.511 (3)
C and D {	49.0	1.84	7.0, 8.0	1874.494
	47.9	1.93	7.0, 8.0	1874.511
AB and C {	336.9	40.58		1874.494
	336.9	40.97		1874.546
Mean A and B P = 359.1				
C and D 48.4				

NOTES.—(1) Although rather unsteady, I believe there is no trace of vertical elongation [in other stars, or from atmospheric causes].

(2) The wedge appears to me certain, and now and then I strongly suspect a separation. There is no sign whatever of vertical elongation. During the evening many couples of low declination were observed, but they offered no trace of elongation.

(3) A thin black line is seen, although intermittently. I have estimated the distance at 0".6. Should the measured distance, = 0".84, be thought too large, it must be kept in mind that the spurious disks of 4.0 and 7.0 must cover a not indifferent portion of the distance between the centres, and reduce it to a very thin thread.

The distance between C and D, so far as I am aware, has never before been measured. The angle may have slightly increased since the first observations. The principal measures of the several stars in chronological order are as follow:—

		A B and C.		C and D.		A and B.
		Pos.	Dist.	Pos.	Dist.	o
1781.4	Herschel I.	334.8	38.33	...	...	...
1821.4	South & H. II.	338.2	40.82	...	...	...
1831.5	Smyth	338.5	40.00	...	...	...
1836.5	Herschel II.	336.6	60.5 ±	...	...	...
1847.4	Jacob	...	...	42.2	1.8 ±	...
1847.7	Jacob	336.5	40.57	...	...	...
1848.0	Jacob	...	...	45.4	1.6 ±	...
1855.5	Secchi	331.3	40.58	...	...	...
1874.41	Burnham	...	...	45.7	...	357.7
1874.47	Newcomb	...	...	...	...	5.2
1874.49	Dembowski	336.9	40.78	48.4	1.89	359.1

I estimated the distance of the close pair as not more than $0''.5$, and perhaps not much exceeding $0''.4$; and I still think Dembowski places it too high, though the apparent closeness, as stated in his Note, may be due to other causes. I believe this star will prove to be a binary system—at least, with reference to the close pair. I have observed this many times during the past two years, and always with the same instrument, and necessarily became familiar with its appearance during each year. I am strongly of the opinion that a change in the distance has taken place since it was observed in 1873. I am aware that any appreciable motion in so short a time as less than three-fourths of a year is very improbable; but an increase in the distance of only $0''.1$ would fully account for my being able to decide the question of duplicity and to measure the angle this year, though unable to do so before with the same aperture, notwithstanding I used every effort and every occasion in order to enter it in the Catalogue as double beyond question. It seemed to be a much easier pair this season, and my measures were all made before I learned any other observer had attempted it.

Dembowski says, "it is one of the finest systems known; there are others of the same kind, but none presenting the same striking assemblage of brilliant objects within so narrow bounds."

Chicago, 1874, October 26.

A Fifth Catalogue of 71 New Double Stars. By S. W. Burnham, Esq.

Unlike the four preceding Catalogues, to which my 6-inch refractor has alone contributed, the double stars contained in this have been found with apertures varying from 6 to 26 inches—from what in these days is a small telescope to the giant refractor of the world. Passing through Washington, I spent a few days there, and through the courtesy of Admiral Davis, Superintendent of the United States Naval Observatory, I had the pleasure of using the magnificent 26-inch recently erected by the Messrs. Clark and Sons. I had only one good night, and the 14 double stars in the following pages were all observed on that occasion. Several other equally interesting pairs were found; but, in consequence of trusting too much to diagrams and descriptions, I have not been able since to positively identify them with smaller instruments. The time was principally spent in examining prominent stars, or familiar localities, in order to lose no time in determining places by reading circles, etc. For double star work this instrument seemed to be perfect. I looked up many of the closest double stars I could think of without finding anything that at all approached the limit of the power of the telescope. In